Concept Presentation

Meiosis in Animal cell

Biology: SB13C, SB13U

Specific expectations: E 3.5, E 5, E 6.

Back Ground Information: Meiosis:

It is important that students know and understand that a cell is the unit of life and all living organisms are composed of Eukaryotic cells. The Eukaryotic cell consists of a “True nucleus” with a nuclear membrane and an outer cell membrane. The internal organelles are bounded by outer membranes and also possess a cytoskeleton that gives them a particular shape.

The cell undergoes cell division during growth and development of the organism. The cell division involves nucleus that contains chromosomes- the hereditary material is composed of DNA (Deoxy- ribonucleic acid). Deoxyribonucleic acid is the genetic material of all organisms. Chromosomes the thread like material in the nucleus is composed of DNA which contains the genetic information which specifies the characteristics of the organism. The chromosomes are protein in nature and play an important role in the reproduction of living organisms.

A chromosome is a continuous strand of DNA on which the genes are located. The genes are the specific regions which carry the genetic code for making specific proteins.

Mitosis involves the division of the nucleus in two daughter nuclei with equal number of chromosomes. The daughter cell consists of the same number of chromosomes as of the parent cell. The somatic cells (non reproductive) undergo mitosis during development and growth of the organism. It is assumed that the students have already covered Mitosis and they have an idea of how the cells multiply and grow in an organism.

Lesson 1:An overview of the nuclear material and its significance in Meiosis. (refresh prior knowledge)

PPT: presentation to describe the diagram and the structure of DNA.

The following terms will be written on the Board and students will be asked to define each term (diagnostic assessment of prior knowledge of mitosis and chromosomes).

* Diploid cell
* Haploid cell
* Gamete
* Homologous chromosomes
* Crossing over

The replication and repair of DNA will be observed on instructional video for introduction. [www.utube:dnareplication](http://www.utube:dnareplication).

The students in pairs will work in a virtual lab on the computers where all necessary information and guidance will be provided by the teacher. The students will study in detail the DNA structure and its significance in the cell reproduction.

Worksheets on DNA structure and its characteristics using online animations of the process and student will answer five questions.

[www.youtube.com/watch?v=12sc](http://www.youtube.com/watch?v=12sc)

[www.hill.com/sites/dna\_structure](http://www.hill.com/sites/dna_structure)

Work sheet attached with five questions.

Lesson 2: Process of Meiosis

An instructional video will be presented to explain the different steps in Meiosis. The internet access will be required to use the [www.Youtube.com.Meiosis](http://www.Youtube.com.Meiosis)

web site and a projector for display the video on an overhead screen.

Later the students will prepare for the role play activity to demonstrate the process of Meiosis.

The class furniture will be arranged on the sides and the central portion of the class will be encircled by a chalk to mark the boundaries of the nucleus. The students will be divided into pairs to represent six chromosomes. There will be 6 pair of students that will stay in the nucleus.

The phases of the Meiosis will also be shown on the projector through the web site You tube to help the students remember their role and various steps in the process. The students will form pairs to show DNA replication in the preceding interphase to form two chromatids. The students playing the role of chromosomes will identify themselves as maternal or praternal chromosomes by labeled color bands.

Meiosis consists of two cell divisions Meiosis 1and Meiosis 2. Meiosis 1: As the cell enters into the first phase called prophase 1, centrosome students will move to the opposite poles of the nucleus and forms the meiotic spindle. The meiotic spindle students will hold the chromosome students on the central line of the nucleus. The student homologous chromosomes will form pairs which is called synapses. The students forming the nuclear membrane will disintegrate and the crossing over between student homologous chromosomes occurs. The exchange of colored bands will show the chiasmata in the recombinant students’ chromosomes.

At metaphase 1: The centrosome students will attach to the student chromosomes and arrange them on the equatorial plate with one student homologue on either side of the plate.

Anaphase 1: Describe the movement of student chromosomes from each pair to the opposite poles of the cell. The cell membrane students will move inwards dividing the cell into two cells.

The students will finish their activity as the lesson ends.

Lesson 3: Meiosis 2

The instructional video from the [www.youtube.com.meiosis](http://www.youtube.com.meiosis) will continue for the third day explaining the next phase of Meiosis 2.

Chromosome behavior in Meiosis 2 is like of mitosis.

Student Activity: The students will be asked to put together a flip book of meiosis using index cards.

The students will be asked to write a paragraph explaining the following points:

* The purpose of meiosis,
* How the resulting cells differ from the parent cell.

The students will do “inside outside circle” activity and will discuss different phases of Meiosis and its significance

Concept Maps: The students are asked to draw concept map for the process of Meiosis.

The Follow up Activity: the students will be asked to draw a wall chart of Meiosis and mutations. The students will work in groups of two to three students in each group and will finish in two days at the end of the unit.

Lesson 4: Significance of Meiosis.

The teacher will ask students to answer following questions to brain storm the ideas:

Qs. How Meiosis results in the formation of gametes?

Qs. How meiosis generates genetically unique cells?

Qs. Why it is important for gametes to contain half of the DNA of the parent cell?

The students will be encouraged to “peer share” activity for discussion for ten minutes.

The students will watch a power point presentation explaining the possible genetic disorders in humans resulting from the combination of chromosomes during “Crossing -Over” in meiosis.

Power point presentation attached.

The students are asked to complete a work sheet following the slide presentation.

**Work Sheet:**

Qs.1 Explain how the Non-disjunction can lead to changes in chromosome number illustrated by references to Down syndrome (Trisomy 21). **When there is a non-disjunction of the 21st chromosome in meiosis I, then there are 3 copies of the 21st chromosome in one cell, and only 1 copy in the second. As they replicate in Meiosis II, there are 3 full copies of 21 in gametes 1 and 2, and only 1 copy in gametes 3 and 4.**

Qs. 2 Will it be ethical for parents to have their children screened prior to birth and decide not to have a child with a genome that is undesirable. Discuss. **Ethics are decided on opinions, and not necessarily fact. It could be beneficial for certain cultures to have screenings for diseases so that unnecessary child murders do not take place. In western society, however, I don’t believe that it will be acceptable to terminate pregnancies early just because of possible diseases.**

Potential student difficulties and possible solutions:

The process of Meiosis is similar to the cell division Mitosis therefore the students may find difficult to understand Meiosis 2-the second phase of meiosis.

The formation of chiasmata between the homologous chromosomes and the exchange of genetic material may be difficult to understand. However, the role play activity and making of flip book on meiosis could help students to understand the various stages of meiosis. The chromosomal variations and mutations due to crossing over between chromosomes in meiosis may also be difficult to explain. The power point presentation will help to develop their understanding. The drawing of concept maps showing meiosis also helps to understand the concept. The other activities like “peer share” and “inside outside circle” involves discussion among the students and clear many miss concepts.

Differentiated Assessment:

The students will be assessed throughout the unit in various ways. The assessment will be mostly in the form of guided practice and formative assessment to explain and improve the learning abilities of the students. The introduction at the beginning of each lesson includes brain storming activities and presentation of videos and slides to refresh the prior knowledge of the students.

The ELL and IEL learners are also assessed differentially and given sufficient extra time to finish their class activities. The ‘role play activity’ helped the kinesthetic learner to understand meiosis. Virtual lab activity and work sheets also provide formative assessments about the achievements of the students.

The preparation of wall chart on meiosis by different groups in the class involved students’ multiple intelligence. The summative assessment was done by the work sheet given at the end of the unit.

Application and societal issues:

Students will understand the significance of meiosis, the change in the genetic as well as the physical characteristics of animals. The traits that exhibit themselves in different ways in animals include different hair, eye and skin color, height etc. The mutations in the chromosomes that result in genetic diseases like down syndrome and its correlation between maternal age helps the students to connect science with society. The controversial question related to the screening of child genes before birth and its possible termination raise many issues in the society and students will try to think of possible solutions to this problem.

References:

1. [www.youtube.com/miosis](http://www.youtube.com/miosis)

The students will study the DNA structure, its characteristics, and the different stages of meiosis.

1. Molecular Biology of the cell by Bruce Alberts, James D Watson.
2. Kimbells biology
3. Grade 11 Biology
4. [www.utube:dna.replication](http://www.utube:dna.replication)
5. [www.hill.com/sitesdna\_structure](http://www.hill.com/sitesdna_structure)
6. [www.youtube.com/watch](http://www.youtube.com/watch)

Students will study meiosis by animation.